## REMARKS

Claims 1 to 20 are all the claims pending in the application, prior to the present Amendmentt.

Claims 1 to 4 and 19 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent App. No. 2003/0219630 Al to Moriwaki et al, alone or further in view of an alleged admission by applicants.

Applicants submit that Moriwaki et al and applicants' alleged admission do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

Applicants have amended claim 1 to incorporate subject matter from claims 2 and 3. Applicants have canceled claims 2 and 3. Applicants have also amended claim 1 to further make it clear that the grain boundaries of the perpendicular magnetic recording layer contain an oxide of silicon and an oxide of at least one other specified element. Applicants have amended claims 7 and 8 to refer to oxides.

In the Amendment Under 37 C.F.R. § 1.111 filed on August 4, 2009, applicants relied on unexpected results that are shown in the present specification to support the patentability of the present invention. In the present Office Action, the Examiner states that applicants have presented only arguments by counsel and that the arguments provided by the applicant regarding the unexpected results must be supported by a declaration or affidavit.

Applicants disagree with the Examiner's assertion that applicants have presented only arguments by counsel and that the evidence that applicants rely on for unexpected results must be supported by a declaration or affidavit. In particular, the MPEP at section 2145 states that

rebuttal evidence and arguments can be presented in the specification, and cites the case of *In re Soni*, 54 F.3d 746, 750, 34 USPQ2d 1684, 1687 (Fed. Cir. 1995) as support for this statement.

In the present case, applicants have argued that the present specification contains evidence of unexpected results. As the case of *In re Soni* makes clear, it is error not to consider evidence in the specification. Accordingly, applicants submit that they can rely on the evidence of unexpected results shown in the specification and that the Examiner must consider this evidence.

The Examiner also states in the present Office Action that the present claims are not commensurate in scope to the alleged unexpected results because they do not contain the recitations of claims 2 and 3 and they do not require that the "at least one element" is also in the form of an oxide.

In response, and as noted above, applicants have amended claim 1 to add the subject matter of claims 2 and 3 and to further make it clear that the grain boundaries of the perpendicular magnetic recording layer contain an oxide of silicon and an oxide of at least one other specified element. Claim 2 defined the ratio of the total amount of alkali-metal oxides in the grain boundary layer of the perpendicular magnetic recording layer, and claim 3 defined a species of the magnetic crystal particles.

Thus, the present invention as set forth in claim 1 as amended above is directed to a perpendicular magnetic recording medium comprising a substrate, at least one underlayer formed above the substrate, and a perpendicular magnetic recording layer formed above the at least one underlayer. An easy magnetization axis of the perpendicular magnetic recording layer is oriented perpendicular to the substrate. The at least one underlayer has a granular structure including metal particles and grain boundaries surrounding the metal particles and the

perpendicular magnetic recording layer includes magnetic crystal particles and grain boundaries surrounding the magnetic crystal particles. The granular underlayer contains Ru as the metal particles and the grain boundaries of the metal particles contain silicon oxide and an oxide of at least one element selected from the group consisting of Li, Na, K, Rb and Cs. The magnetic crystal particles contain Co as the main component and further contain Pt and Cr and the grain boundaries contain an oxide of silicon and at least one element selected from the group consisting of Li, Na, K, Rb, and Cs. The ratio of a total amount of silicon oxide and at least one oxide of Si, Li, Na, K, Rb, and Cs in the granular underlayer is no less than 1 mol% and no more than 20 mol%. Further, a ratio of total amount of one oxide of Li, Na, K, Rb, and Cs contained at the grain boundaries in the perpendicular magnetic recording layer is no less than 1 mol% and no more than 30 mol% based on the total moles of the oxides of silicon and Li, Na, K, Rb, and Cs contained at the grain boundaries.

The drawings illustrate an embodiment of the present invention in which the magnetic recording medium of the present invention comprises a substrate 11, at least one underlayer which is illustrated by a first underlayer 14 or a second underlayer 13, and a perpendicular magnetic recording layer 15. The easy magnetization axis of perpendicular magnetic recording layer 15 is oriented perpendicular to the substrate surface. The at least one underlayer and the perpendicular magnetic recording layer have metal particles at the center and the grain boundaries surrounding the metal particles, which contain silicon oxide and at least one oxide of an alkali metal selected from the group of Li, Na, K, Rb and Cs, and a total amount of oxides including silicon oxide and at least one alkali metal oxide is in a range of more than 1 mol% and less than 30 mol %.

At least one underlayer, such as the first underlayer, comprises Ru-$SiO_2$ + $R_2O$, where R is an alkali metal selected from the group of Li, Na, K, Rb and Cs. The second underlayer can comprise Ru. The perpendicular magnetic recording layer has a granular structure comprising CoPtCr based magnetic particles and the grain boundaries composed of $SiO_2$ and an oxide of alkali metal selected from Li, Na, K, Rb and Cs, wherein the total amount of oxide in the grain boundaries are within a range of more than 1 mol % and less than 30 mol%.

As a result of forming the at least one underlayer so as to surround the Ru metal particles by the boundary layers composed of $SiO_2$ and $R_2O$ that is at least one oxide of an alkali-metal selected from the group of Li, Na, K, Rb and Cs, and also forming the perpendicular magnetic recording layer by surrounding the magnetic particles (CoPtCr) by the boundary layers composed of $SiO_2$ and at least one oxide of an oxide of alkali-metal selected from Li, Na, K, Rb and Cs, an unexpected result has been obtained that the phase separation was made easy and SNRm of the magnetic recording medium was considerably improved.

Moriwaki et al disclose on a substrate, the sequential stacking of an undercoat layer (for example, a thermosetting resin), a soft magnetic layer (FePt or CoPt), an intermediate layer (Ta, Ta-Si, Ru), an underlying layer (RuTi) and a magnetic recording layer (CoPtCr + $SiO_2$). Moriwaki et al are silent with respect to providing an underlayer having a granular structure.

Moreover, Moriwaki et al do not indicate that an underlayer and a perpendicular magnetic recording layer have a granular structure by addition of $SiO_2$ and $R_2O$ for phase separation.

That is, Moriwaki et al do not disclose a magnetic recording medium having the feature of the present invention that at least one underlayer has a granular structure and its boundary layer is comprised of Ru-$SiO_2$ + $R_2O$, where $R_2O$ is at least one oxide of an alkali-metal selected

from the group of Li, Na, K, Rb and Cs, and do not disclose the feature of the present invention that the magnetic recording layer has the granular structure having the boundary layer comprised of Ru-$SiO_2$ + $R_2O$. Thus, Moriwaki et al do not disclose the features of the present invention in that at least one underlayer of the present invention has a granular structure having segregated Ru particles and the boundaries containing Ru-$SiO_2$ + $R_2O$ and the magnetic recording layer of the present invention have a granular structure and its grain boundaries contain Ru-$SiO_2$ + $R_2O$.

JP 2002-83411, which is discussed in the present specification, and which forms the basis for applicants' alleged admission, provides a magnetic recording medium comprising nonmagnetic substrate and a magnetic recording layer formed on the substrate. The magnetic recording layer has a granular structure comprising magnetic metal particles (CoPt or CoPtCr) and grain boundaries containing $SiO_2$ or an MxOy oxide selected from the group consisting of $Cr_2O_3$, $TiO_2$, $ZrO_2$ and $Y_2O_3$. JP 2002-83411 notes that the addition of one oxide makes it possible to divide mutual interactions between magnetic metal grains.

However, JP 2002-83411 does not disclose the feature of the present invention that at least one underlayer and the perpendicular magnetic recording layer have a granular structure and the grain boundaries are formed by the complex oxides of $SiO_2$ and $R_2O$, where $R_2O$ is at least one oxide of an alkali-metal selected from the group of Li, Na, K, Rb and Cs, for efficient phase separation.

JP 9-204651, which is also discussed in the present specification, and which also forms the basis for applicants' alleged admission, provides a magnetic recording medium that comprises a nonmagnetic substrate and a magnetic recording film formed on the substrate.

The magnetic recording film of JP 9-204651 is characterized in containing at least one alkaline-earth metal oxide (R'O). Specifically, the magnetic recording layer formed on the

substrate comprises CoPt-CaO (Example 1) or CoPt- $SiO_2$-MgO (Example 2). That is, the magnetic recording layer of JP 9-204651 has a granular structure in which magnetic metal particles (CoPt) is separated by the grain boundaries.

The present invention comprises the grain boundaries composed of $SiO_2$ and $R_2O$, where $R_2O$ is an alkali-metal oxide. In contrast, the grain boundary of JP 9-204651 is composed of an alkaline-earth metal oxide (R'O) or $SiO_2$ + R'O.

In addition, JP 9-204651 differs from the present invention, in which at least one underlayer and the perpendicular magnetic recording layer have granular structure in which metal particles are separated by grain boundaries. JP 9-204651 does not disclose the feature of the present invention that not only the magnetic recording layer, but also at least one underlayer, have a structure in which metal particles are separated by the boundary layers.

The Examiner alleges that it is obvious for one of ordinary skill in the art to make a granular structure as shown in Moriwaki et al, JP 2002-83411 and JP 9-204651. The Examiner deems that one of ordinary skill in the art would be motivated to make and use the claimed relative mixing ratio of the two substance ($SiO_2$ and the total amount of Li, Na, K, Rb and Cs) in searching for an optimal matrix oxide. The Examiner also deems that it would have been obvious to one having ordinary skill in the art to determine an amount of the relative substances meeting applicants' claimed mol percent by optimizing the result effective variable through routine experimentation.

However, Moriwaki et al, JP 2002-83411 and JP 9-204651 3 do not disclose the two important features of the present application.

The first feature of the present application is that oxides are introduced in both of the at least one underlayer and the perpendicular magnetic recording layer so that the crystal particles

of both layers are separated by oxide containing boundary layers so that crystal particles are maintained as fme particles. No reference discloses this feature.

The second feature is that, in separating metal particles by the boundary layers, formation of boundary layers are made easier by introducing alkali-metal oxide in addition to silicon oxide so that the fine metal particles are preserved. These two features bring about the unexpected effect that the magnetic recording medium of the present invention exhibits high SNRm.

In view of the above, applicants submit that Moriwaki et al and applicants' alleged admission do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

Claims 5 to 8 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Moriwaki et al alone or in view of applicants' alleged admissions, as applied above, and further in view of JP 2002-334424 A to Kokubu et al and U.S. Patent No. 6,696,172 B2 to Oikawa et al for the reasons of record as set forth in Paragraph No. 5 of the Office Action mailed on May 4, 2009.

Applicants submit that Moriwaki et al, applicants' alleged admission, Kokubu et al and Oikawa et al do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

The Examiner states that Moriwaki et al and applicants' admissions do not disclose an underlayer meeting the claimed limitations.

Claims 5 to 8 depends from claim 1. Accordingly, applicants submit that claims 5 to 8 are patentable for the same reasons as discussed above with respect to claim 1.

Further, Kokubu et al disclose a magnetic recording medium that has a layered structure on a nonmagnetic substrate 1, a soft magnetic underlayer 2, a orientation control layer, a

perpendicular magnetic recording layer 5 and a protective layer 6, formed sequentially in this order on the substrate 1. The orientation control film comprises an alloy selected from Ru-V, Ru-Nb, Ru-W, and an oxide containing metal selected from Ru-$SiO_2$, Ru-$ZrO_2$ and Re-$TiO_2$.

Although Kokubu et al disclose adding an oxide to the orientation control film in order to suppress generation of coarse metal particles, Kokubu et al do not add a plural oxide including $SiO_2$ and $R_2O$ as applied in the present invention. In addition, Kokubu et al do not incorporate oxide into the perpendicular magnetic layer, which also differentiates Kokubu et al from the present invention.

Oikawa et al disclose a magnetic recording medium comprising a nonmagnetic substrate, a nonmagnetic undercoat layer made of Cr or CrMo, a granular nonmagnetic intermediate layer (nonmagnetic crystal particle is CoCr + $SiO_2$), a granular magnetic layer (CoCrPt+ $SiO_2$), and a protective layer. The magnetic layer has a granular structure composed of crystal particles of CoPtCr and boundaries of oxides or carbide of Cr, Al and Si.

The present invention adopts a granular structured for at least one underlayer (Ru + $SiO_2$ + $R_2O$) and a granular magnetic recording layer comprising alloy particles (CoCrPt) and plural oxides ($SiO_2$ + $R_2O$) surrounding the alloy particles. Oikawa et al differ from the present invention in that Oikawa et al adopt a granular structured intermediate layer comprising an alloy particles (CoCr) and surrounding boundaries containing $SiO_2$, and the granular magnetic layer composed of magnetic particles (CoCrPt) and an oxide or carbide of Cr, Co, Si or Al. Oikawa et al do not use plural oxides of $SiO_2$ and $R_2O$ for segregation of an underlayer and the perpendicular magnetic recording layer.

The Examiner rejected claims 5-8 as being obvious regardless of the fact that no reference discloses the feature of the present application that plural type of oxides such as $SiO_2$

and alkali-metal oxide are used for the boundary formation. That is, no reference discloses that at least one undercoat layer and the perpendicular magnetic layer are phase separated by addition of oxides, and oxides include $SiO_2 + R_2O$.

Moreover, since claims 5-8 are dependent on claim 1, and since claim 1 is not obvious in view of any references, claims 5-8 are not obvious.

In view of the above, applicants submit that Moriwaki et al, applicants' alleged admission, Kokubu et al and Oikawa et al do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

Claim 20 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Moriwaki et al, alone or in view of applicants' alleged admissions, as applied above, and further in view of U.S. Patent App. No. 2002/0160232 Al to Shimizu et al for the reasons of record as set forth in Paragraph No. 6 of the Office Action mailed on May 4, 2009.

Applicants submit that Moriwaki et al, applicants' alleged admission, and Shimizu et al do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

Claim 20 depends from claim 1. Accordingly, applicants submit that the arguments that applicants set forth above for claim 1 support the patentability of claim 20.

Further, Shimizu et al disclose on a nonmagnetic substrate 1 (glass), a soft magnetic underlayer 2 (CoZrNb), a first orientation control film 3a (NiA1), a second orientation control film 3b (RuCo), a perpendicular magnetic film 4 (CoCrPtX, X=Mo, B, V, W and Zr) and a protective layer 5 (DLC) were stacked in this order.

In Shimizu et al, no film including the underlayer, orientation control films, and the perpendicular magnetic film contains oxide so as to form the granular structure to isolate metal particles in the boundary layers.

In addition, the present magnetic read/write head claimed in claim 20 is not obvious, because the single magnetic recording head used as the read/write head for reading and recording the perpendicular magnetic recording medium of the present invention which differs from the prior art references cited by the Examiner and applicants' alleged admissions.

In view of the above, applicants submit that Moriwaki et al, applicants' alleged admission, and Shimizu et al do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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